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SEQUENCE LISTING

THE JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE
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<120> DETECTION AND TREATMENT OF POLYCYSTIC KIDNEY DISEASE

<130> JHU1680-2

<140> US 09/904,968
<141> 2001-07-13

<150> US 60/283,691
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<150> US 60/218,261
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acaaggtcca ccccagcagc acttagtcct ccttcctggc gggggtgggc cgtggagtcg   51900

gagtggacac cgctcagtat tactttctgc cgctgtcaag gccgagggcc aggcagaatg   51960

gctgcacgta ggttccccag agagcaggca ggggcatctg tctgtctgtg ggcttcagca   52020

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atggtgttaa aatgtgtata tttttgtatg tcactatttt cactagggct gaggggcctg   52380

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agcccggctg ctgcttggat gcgagcttgg ccttgggccg gtgctggggg cacagctgtc   52500

tgccaggcac tctcatcacc ccagaggcct tgtcatcctc ccttgcccca ggccaggtag   52560

caagagagca gcgcccaggc ctgctggcat caggtctggg caagtagcag gactaggcat   52620

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gcccaggcag cctcaaggcc ctcggagctg gctgtgcctg cttctgtgta ccacttctgt   52800

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caataaaaga gctgtctgac tgcaatctgt gcctctatgt ctgtgcactg gggtcaggac   52920

tttatttatt tcactgacag gcaataccgt ccaaggccag tgcaggaggg agggccccgg   52980

cctcacacaa actcggtgaa gtcctccacc gaggagatga ggcgcttccg ctggcccacc   53040

tcatagccag gtgtgggctc ggctggagtc tgtgcagggg ctttgctatg ggacggaggg   53100

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gg                                                                  53522
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<212> PRT
<213> Homo sapiens

<400> 2

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Met Pro Pro Ala Ala Pro Ala Arg Leu Ala Leu Ala Leu Gly Leu Gly
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Leu Trp Leu Gly Ala Leu Ala Gly Gly Pro Gly Arg Gly Cys Gly Pro
            20                  25                  30

Cys Glu Pro Pro Cys Leu Cys Gly Pro Ala Pro Gly Ala Ala Cys Arg
```

```
         35                        40                        45

Val Asn Cys Ser Gly Arg Gly Leu Arg Thr Leu Gly Pro Ala Leu Arg
    50                  55                  60

Ile Pro Ala Asp Ala Thr Glu Leu Asp Val Ser His Asn Leu Leu Arg
65                  70                  75                  80

Ala Leu Asp Val Gly Leu Leu Ala Asn Leu Ser Ala Leu Ala Glu Leu
            85                  90                  95

Asp Ile Ser Asn Asn Lys Ile Ser Thr Leu Glu Glu Gly Ile Phe Ala
            100                 105                 110

Asn Leu Phe Asn Leu Ser Glu Ile Asn Leu Ser Gly Asn Pro Phe Glu
        115                 120                 125

Cys Asp Cys Gly Leu Ala Trp Leu Pro Gln Trp Ala Glu Glu Gln Gln
    130                 135                 140

Val Arg Val Val Gln Pro Glu Ala Ala Thr Cys Ala Gly Pro Gly Ser
145                 150                 155                 160

Leu Ala Gly Gln Pro Leu Leu Gly Ile Pro Leu Leu Asp Ser Gly Cys
            165                 170                 175

Gly Glu Glu Tyr Val Ala Cys Leu Pro Asp Asn Ser Ser Gly Thr Val
            180                 185                 190

Ala Ala Val Ser Phe Ser Ala Ala His Glu Gly Leu Leu Gln Pro Glu
            195                 200                 205

Ala Cys Ser Ala Phe Cys Phe Ser Thr Gly Gln Gly Leu Ala Ala Leu
    210                 215                 220

Ser Glu Gln Gly Trp Cys Leu Cys Gly Ala Ala Gln Pro Ser Ser Ala
225                 230                 235                 240

Ser Phe Ala Cys Leu Ser Leu Cys Ser Gly Pro Pro Ala Pro Pro Ala
            245                 250                 255

Pro Thr Cys Arg Gly Pro Thr Leu Leu Gln His Val Phe Pro Ala Ser
            260                 265                 270

Pro Gly Ala Thr Leu Val Gly Pro His Gly Pro Leu Ala Ser Gly Gln
            275                 280                 285

Leu Ala Ala Phe His Ile Ala Ala Pro Leu Pro Val Thr Asp Thr Arg
    290                 295                 300

Trp Asp Phe Gly Asp Gly Ser Ala Glu Val Asp Ala Ala Gly Pro Ala
305                 310                 315                 320

Ala Ser His Arg Tyr Val Leu Pro Gly Arg Tyr His Val Thr Ala Val
            325                 330                 335

Leu Ala Leu Gly Ala Gly Ser Ala Leu Leu Gly Thr Asp Val Gln Val
            340                 345                 350

Glu Ala Ala Pro Ala Ala Leu Glu Leu Val Cys Pro Ser Ser Val Gln
    355                 360                 365
```

Ser Asp Glu Ser Leu Asp Leu Ser Ile Gln Asn Arg Gly Gly Ser Gly
    370   375   380

Leu Glu Ala Ala Tyr Ser Ile Val Ala Leu Gly Glu Glu Pro Ala Arg
385   390   395   400

Ala Val His Pro Leu Cys Pro Ser Asp Thr Glu Ile Phe Pro Gly Asn
            405   410   415

Gly His Cys Tyr Arg Leu Val Val Glu Lys Ala Ala Trp Leu Gln Ala
            420   425   430

Gln Glu Gln Cys Gln Ala Trp Ala Gly Ala Ala Leu Ala Met Val Asp
        435   440   445

Ser Pro Ala Val Gln Arg Phe Leu Val Ser Arg Val Thr Arg Ser Leu
    450   455   460

Asp Val Trp Ile Gly Phe Ser Thr Val Gln Gly Val Glu Val Gly Pro
465   470   475   480

Ala Pro Gln Gly Glu Ala Phe Ser Leu Glu Ser Cys Gln Asn Trp Leu
            485   490   495

Pro Gly Glu Pro His Pro Ala Thr Ala Glu His Cys Val Arg Leu Gly
            500   505   510

Pro Thr Gly Trp Cys Asn Thr Asp Leu Cys Ser Ala Pro His Ser Tyr
            515   520   525

Val Cys Glu Leu Gln Pro Gly Gly Pro Val Gln Asp Ala Glu Asn Leu
    530   535   540

Leu Val Gly Ala Pro Ser Gly Asp Leu Gln Gly Pro Leu Thr Pro Leu
545   550   555   560

Ala Gln Gln Asp Gly Leu Ser Ala Pro His Glu Pro Val Glu Val Met
            565   570   575

Val Phe Pro Gly Leu Arg Leu Ser Arg Glu Ala Phe Leu Thr Thr Ala
            580   585   590

Glu Phe Gly Thr Gln Glu Leu Arg Arg Pro Ala Gln Leu Arg Leu Gln
        595   600   605

Val Tyr Arg Leu Leu Ser Thr Ala Gly Thr Pro Glu Asn Gly Ser Glu
    610   615   620

Pro Glu Ser Arg Ser Pro Asp Asn Arg Thr Gln Leu Ala Pro Ala Cys
625   630   635   640

Met Pro Gly Gly Arg Trp Cys Pro Gly Ala Asn Ile Cys Leu Pro Leu
            645   650   655

Asp Ala Ser Cys His Pro Gln Ala Cys Ala Asn Gly Cys Thr Ser Gly
            660   665   670

Pro Gly Leu Pro Gly Ala Pro Tyr Ala Leu Trp Arg Glu Phe Leu Phe
        675   680   685

Ser Val Pro Ala Gly Pro Pro Ala Gln Tyr Ser Val Thr Leu His Gly
690   695   700

Gln Asp Val Leu Met Leu Pro Gly Asp Leu Val Gly Leu Gln His Asp
705   710   715   720

Ala Gly Pro Gly Ala Leu Leu His Cys Ser Pro Ala Pro Gly His Pro
            725   730   735

Gly Pro Arg Ala Pro Tyr Leu Ser Ala Asn Ala Ser Ser Trp Leu Pro
            740   745   750

His Leu Pro Ala Gln Leu Glu Gly Thr Trp Gly Cys Pro Ala Cys Ala
            755   760   765

Leu Arg Leu Leu Ala Gln Arg Glu Gln Leu Thr Val Leu Leu Gly Leu
    770   775   780

Arg Pro Asn Pro Gly Leu Arg Leu Pro Gly Arg Tyr Glu Val Arg Ala
785   790   795   800

Glu Val Gly Asn Gly Val Ser Arg His Asn Leu Ser Cys Ser Phe Asp
            805   810   815

Val Val Ser Pro Val Ala Gly Leu Arg Val Ile Tyr Pro Ala Pro Arg
            820   825   830

Asp Gly Arg Leu Tyr Val Pro Thr Asn Gly Ser Ala Leu Val Leu Gln
            835   840   845

Val Asp Ser Gly Ala Asn Ala Thr Ala Thr Ala Arg Trp Pro Gly Gly
    850   855   860

Ser Leu Ser Ala Arg Phe Glu Asn Val Cys Pro Ala Leu Val Ala Thr
865   870   875   880

Phe Val Pro Ala Cys Pro Trp Glu Thr Asn Asp Thr Leu Phe Ser Val
            885   890   895

Val Ala Leu Pro Trp Leu Ser Glu Gly Glu His Val Val Asp Val Val
            900   905   910

Val Glu Asn Ser Ala Ser Arg Ala Asn Leu Ser Leu Arg Val Thr Ala
    915   920   925

Glu Glu Pro Ile Cys Gly Leu Arg Ala Thr Pro Ser Pro Glu Ala Arg
    930   935   940

Val Leu Gln Gly Val Leu Val Arg Tyr Ser Pro Val Val Glu Ala Gly
945   950   955   960

Ser Asp Met Val Phe Arg Trp Thr Ile Asn Asp Lys Gln Ser Leu Thr
            965   970   975

Phe Gln Asn Val Val Phe Asn Val Ile Tyr Gln Ser Ala Ala Val Phe
            980   985   990

Lys Leu Ser Leu Thr Ala Ser Asn His Val Ser Asn Val Thr Val Asn
    995   1000   1005

Tyr Asn Val Thr Val Glu Arg Met Asn Arg Met Gln Gly Leu Gln

```
        1010                        1015                        1020

Val Ser  Thr Val Pro Ala Val  Leu Ser Pro Asn Ala  Thr Leu Ala
        1025                        1030                        1035

Leu Thr  Ala Gly Val Leu Val  Asp Ser Ala Val Glu  Val Ala Phe
        1040                        1045                        1050

Leu Trp  Thr Phe Gly Asp Gly  Glu Gln Ala Leu His  Gln Phe Gln
        1055                        1060                        1065

Pro Pro  Tyr Asn Glu Ser Phe  Pro Val Pro Asp Pro  Ser Val Ala
        1070                        1075                        1080

Gln Val  Leu Val Glu His Asn  Val Thr His Thr Tyr  Ala Ala Pro
        1085                        1090                        1095

Gly Glu  Tyr Leu Leu Thr Val  Leu Ala Ser Asn Ala  Phe Glu Asn
        1100                        1105                        1110

Leu Thr  Gln Gln Val Pro Val  Ser Val Arg Ala Ser  Leu Pro Ser
        1115                        1120                        1125

Val Ala  Val Gly Val Ser Asp  Gly Val Leu Val Ala  Gly Arg Pro
        1130                        1135                        1140

Val Thr  Phe Tyr Pro His Pro  Leu Pro Ser Pro Gly  Gly Val Leu
        1145                        1150                        1155

Tyr Thr  Trp Asp Phe Gly Asp  Gly Ser Pro Val Leu  Thr Gln Ser
        1160                        1165                        1170

Gln Pro  Ala Ala Asn His Thr  Tyr Ala Ser Arg Gly  Thr Tyr His
        1175                        1180                        1185

Val Arg  Leu Glu Val Asn Asn  Thr Val Ser Gly Ala  Ala Ala Gln
        1190                        1195                        1200

Ala Asp  Val Arg Val Phe Glu  Glu Leu Arg Gly Leu  Ser Val Asp
        1205                        1210                        1215

Met Ser  Leu Ala Val Glu Gln  Gly Ala Pro Val Val  Val Ser Ala
        1220                        1225                        1230

Ala Val  Gln Thr Gly Asp Asn  Ile Thr Trp Thr Phe  Asp Met Gly
        1235                        1240                        1245

Asp Gly  Thr Val Leu Ser Gly  Pro Glu Ala Thr Val  Glu His Val
        1250                        1255                        1260

Tyr Leu  Arg Ala Gln Asn Cys  Thr Val Thr Val Gly  Ala Gly Ser
        1265                        1270                        1275

Pro Ala  Gly His Leu Ala Arg  Ser Leu His Val Leu  Val Phe Val
        1280                        1285                        1290

Leu Glu  Val Leu Arg Val Glu  Pro Ala Ala Cys Ile  Pro Thr Gln
        1295                        1300                        1305

Pro Asp  Ala Arg Leu Thr Ala  Tyr Val Thr Gly Asn  Pro Ala His
        1310                        1315                        1320
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Tyr Leu Phe Asp Trp Thr Phe Gly Asp Gly Ser Ser Asn Thr Thr
    1325   1330   1335

Val Arg Gly Cys Pro Thr Val Thr His Asn Phe Thr Arg Ser Gly
    1340   1345   1350

Thr Phe Pro Leu Ala Leu Val Leu Ser Ser Arg Val Asn Arg Ala
    1355   1360   1365

His Tyr Phe Thr Ser Ile Cys Val Glu Pro Glu Val Gly Asn Val
    1370   1375   1380

Thr Leu Gln Pro Glu Arg Gln Phe Val Gln Leu Gly Asp Glu Ala
    1385   1390   1395

Trp Leu Val Ala Cys Ala Trp Pro Pro Phe Pro Tyr Arg Tyr Thr
    1400   1405   1410

Trp Asp Phe Gly Thr Glu Glu Ala Ala Pro Thr Arg Ala Arg Gly
    1415   1420   1425

Pro Glu Val Thr Phe Ile Tyr Arg Asp Pro Gly Ser Tyr Leu Val
    1430   1435   1440

Thr Val Thr Ala Ser Asn Asn Ile Ser Ala Ala Asn Asp Ser Ala
    1445   1450   1455

Leu Val Glu Val Gln Glu Pro Val Leu Val Thr Ser Ile Lys Val
    1460   1465   1470

Asn Gly Ser Leu Gly Leu Glu Leu Gln Gln Pro Tyr Leu Phe Ser
    1475   1480   1485

Ala Val Gly Arg Gly Arg Pro Ala Ser Tyr Leu Trp Asp Leu Gly
    1490   1495   1500

Asp Gly Gly Trp Leu Glu Gly Pro Glu Val Thr His Ala Tyr Asn
    1505   1510   1515

Ser Thr Gly Asp Phe Thr Val Arg Val Ala Gly Trp Asn Glu Val
    1520   1525   1530

Ser Arg Ser Glu Ala Trp Leu Asn Val Thr Val Lys Arg Arg Val
    1535   1540   1545

Arg Gly Leu Val Val Asn Ala Ser Arg Thr Val Val Pro Leu Asn
    1550   1555   1560

Gly Ser Val Ser Phe Ser Thr Ser Leu Glu Ala Gly Ser Asp Val
    1565   1570   1575

Arg Tyr Ser Trp Val Leu Cys Asp Arg Cys Thr Pro Ile Pro Gly
    1580   1585   1590

Gly Pro Thr Ile Ser Tyr Thr Phe Arg Ser Val Gly Thr Phe Asn
    1595   1600   1605

Ile Ile Val Thr Ala Glu Asn Glu Val Gly Ser Ala Gln Asp Ser
    1610   1615   1620

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Ile Phe  Val Tyr Val Leu Gln  Leu Ile Glu Gly Leu  Gln Val Val
    1625                 1630                 1635

Gly Gly  Gly Arg Tyr Phe Pro  Thr Asn His Thr Val  Gln Leu Gln
    1640                 1645                 1650

Ala Val  Val Arg Asp Gly Thr  Asn Val Ser Tyr Ser  Trp Thr Ala
    1655                 1660                 1665

Trp Arg  Asp Arg Gly Pro Ala  Leu Ala Gly Ser Gly  Lys Gly Phe
    1670                 1675                 1680

Ser Leu  Thr Val Leu Glu Ala  Gly Thr Tyr His Val  Gln Leu Arg
    1685                 1690                 1695

Ala Thr  Asn Met Leu Gly Ser  Ala Trp Ala Asp Cys  Thr Met Asp
    1700                 1705                 1710

Phe Val  Glu Pro Val Gly Trp  Leu Met Val Ala Ala  Ser Pro Asn
    1715                 1720                 1725

Pro Ala  Ala Val Asn Thr Ser  Val Thr Leu Ser Ala  Glu Leu Ala
    1730                 1735                 1740

Gly Gly  Ser Gly Val Val Tyr  Thr Trp Ser Leu Glu  Glu Gly Leu
    1745                 1750                 1755

Ser Trp  Glu Thr Ser Glu Pro  Phe Thr Thr His Ser  Phe Pro Thr
    1760                 1765                 1770

Pro Gly  Leu His Leu Val Thr  Met Thr Ala Gly Asn  Pro Leu Gly
    1775                 1780                 1785

Ser Ala  Asn Ala Thr Val Glu  Val Asp Val Gln Val  Pro Val Ser
    1790                 1795                 1800

Gly Leu  Ser Ile Arg Ala Ser  Glu Pro Gly Gly Ser  Phe Val Ala
    1805                 1810                 1815

Ala Gly  Ser Ser Val Pro Phe  Trp Gly Gln Leu Ala  Thr Gly Thr
    1820                 1825                 1830

Asn Val  Ser Trp Cys Trp Ala  Val Pro Gly Gly Ser  Ser Lys Arg
    1835                 1840                 1845

Gly Pro  His Val Thr Met Val  Phe Pro Asp Ala Gly  Thr Phe Ser
    1850                 1855                 1860

Ile Arg  Leu Asn Ala Ser Asn  Ala Val Ser Trp Val  Ser Ala Thr
    1865                 1870                 1875

Tyr Asn  Leu Thr Ala Glu Glu  Pro Ile Val Gly Leu  Val Leu Trp
    1880                 1885                 1890

Ala Ser  Ser Lys Val Val Ala  Pro Gly Gln Leu Val  His Phe Gln
    1895                 1900                 1905

Ile Leu  Leu Ala Ala Gly Ser  Ala Val Thr Phe Arg  Leu Gln Val
    1910                 1915                 1920

Gly Gly  Ala Asn Pro Glu Val  Leu Pro Gly Pro Arg  Phe Ser His
```

1925   1930   1935

Ser Phe Pro Arg Val Gly Asp His Val Val Ser Val Arg Gly Lys
    1940   1945   1950

Asn His Val Ser Trp Ala Gln Ala Gln Val Arg Ile Val Val Leu
    1955   1960   1965

Glu Ala Val Ser Gly Leu Gln Val Pro Asn Cys Cys Glu Pro Gly
    1970   1975   1980

Ile Ala Thr Gly Thr Glu Arg Asn Phe Thr Ala Arg Val Gln Arg
    1985   1990   1995

Gly Ser Arg Val Ala Tyr Ala Trp Tyr Phe Ser Leu Gln Lys Val
    2000   2005   2010

Gln Gly Asp Ser Leu Val Ile Leu Ser Gly Arg Asp Val Thr Tyr
    2015   2020   2025

Thr Pro Val Ala Ala Gly Leu Leu Glu Ile Gln Val Arg Ala Phe
    2030   2035   2040

Asn Ala Leu Gly Ser Glu Asn Arg Thr Leu Val Leu Glu Val Gln
    2045   2050   2055

Asp Ala Val Gln Tyr Val Ala Leu Gln Ser Gly Pro Cys Phe Thr
    2060   2065   2070

Asn Arg Ser Ala Gln Phe Glu Ala Ala Thr Ser Pro Ser Pro Arg
    2075   2080   2085

Arg Val Ala Tyr His Trp Asp Phe Gly Asp Gly Ser Pro Gly Gln
    2090   2095   2100

Asp Thr Asp Glu Pro Arg Ala Glu His Ser Tyr Leu Arg Pro Gly
    2105   2110   2115

Asp Tyr Arg Val Gln Val Asn Ala Ser Asn Leu Val Ser Phe Phe
    2120   2125   2130

Val Ala Gln Ala Thr Val Thr Val Gln Val Leu Ala Cys Arg Glu
    2135   2140   2145

Pro Glu Val Asp Val Val Leu Pro Leu Gln Val Leu Met Arg Arg
    2150   2155   2160

Ser Gln Arg Asn Tyr Leu Glu Ala His Val Asp Leu Arg Asp Cys
    2165   2170   2175

Val Thr Tyr Gln Thr Glu Tyr Arg Trp Glu Val Tyr Arg Thr Ala
    2180   2185   2190

Ser Cys Gln Arg Pro Gly Arg Pro Ala Arg Val Ala Leu Pro Gly
    2195   2200   2205

Val Asp Val Ser Arg Pro Arg Leu Val Leu Pro Arg Leu Ala Leu
    2210   2215   2220

Pro Val Gly His Tyr Cys Phe Val Phe Val Val Ser Phe Gly Asp
    2225   2230   2235

Thr Pro Leu Thr Gln Ser Ile Gln Ala Asn Val Thr Val Ala Pro
2240   2245   2250

Glu Arg Leu Val Pro Ile Ile Glu Gly Gly Ser Tyr Arg Val Trp
2255   2260   2265

Ser Asp Thr Arg Asp Leu Val Leu Asp Gly Ser Glu Ser Tyr Asp
2270   2275   2280

Pro Asn Leu Glu Asp Gly Asp Gln Thr Pro Leu Ser Phe His Trp
2285   2290   2295

Ala Cys Val Ala Ser Thr Gln Arg Glu Ala Gly Gly Cys Ala Leu
2300   2305   2310

Asn Phe Gly Pro Arg Gly Ser Ser Thr Val Thr Ile Pro Arg Glu
2315   2320   2325

Arg Leu Ala Ala Gly Val Glu Tyr Thr Phe Ser Leu Thr Val Trp
2330   2335   2340

Lys Ala Gly Arg Lys Glu Glu Ala Thr Asn Gln Thr Val Leu Ile
2345   2350   2355

Arg Ser Gly Arg Val Pro Ile Val Ser Leu Glu Cys Val Ser Cys
2360   2365   2370

Lys Ala Gln Ala Val Tyr Glu Val Ser Arg Ser Ser Tyr Val Tyr
2375   2380   2385

Leu Glu Gly Arg Cys Leu Asn Cys Ser Ser Gly Ser Lys Arg Gly
2390   2395   2400

Arg Trp Ala Ala Arg Thr Phe Ser Asn Lys Thr Leu Val Leu Asp
2405   2410   2415

Glu Thr Thr Thr Ser Thr Gly Ser Ala Gly Met Arg Leu Val Leu
2420   2425   2430

Arg Arg Gly Val Leu Arg Asp Gly Glu Gly Tyr Thr Phe Thr Leu
2435   2440   2445

Thr Val Leu Gly Arg Ser Gly Glu Glu Glu Gly Cys Ala Ser Ile
2450   2455   2460

Arg Leu Ser Pro Asn Arg Pro Pro Leu Gly Gly Ser Cys Arg Leu
2465   2470   2475

Phe Pro Leu Gly Ala Val His Ala Leu Thr Thr Lys Val His Phe
2480   2485   2490

Glu Cys Thr Gly Trp His Asp Ala Glu Asp Ala Gly Ala Pro Leu
2495   2500   2505

Val Tyr Ala Leu Leu Leu Arg Arg Cys Arg Gln Gly His Cys Glu
2510   2515   2520

Glu Phe Cys Val Tyr Lys Gly Ser Leu Ser Ser Tyr Gly Ala Val
2525   2530   2535

Leu Pro Pro Gly Phe Arg Pro His Phe Glu Val Gly Leu Ala Val
    2540   2545   2550

Val Val Gln Asp Gln Leu Gly Ala Ala Val Val Ala Leu Asn Arg
    2555   2560   2565

Ser Leu Ala Ile Thr Leu Pro Glu Pro Asn Gly Ser Ala Thr Gly
    2570   2575   2580

Leu Thr Val Trp Leu His Gly Leu Thr Ala Ser Val Leu Pro Gly
    2585   2590   2595

Leu Leu Arg Gln Ala Asp Pro Gln His Val Ile Glu Tyr Ser Leu
    2600   2605   2610

Ala Leu Val Thr Val Leu Asn Glu Tyr Glu Arg Ala Leu Asp Val
    2615   2620   2625

Ala Ala Glu Pro Lys His Glu Arg Gln His Arg Ala Gln Ile Arg
    2630   2635   2640

Lys Asn Ile Thr Glu Thr Leu Val Ser Leu Arg Val His Thr Val
    2645   2650   2655

Asp Asp Ile Gln Gln Ile Ala Ala Ala Leu Ala Gln Cys Met Gly
    2660   2665   2670

Pro Ser Arg Glu Leu Val Cys Arg Ser Cys Leu Lys Gln Thr Leu
    2675   2680   2685

His Lys Leu Glu Ala Met Met Leu Ile Leu Gln Ala Glu Thr Thr
    2690   2695   2700

Ala Gly Thr Val Thr Pro Thr Ala Ile Gly Asp Ser Ile Leu Asn
    2705   2710   2715

Ile Thr Gly Asp Leu Ile His Leu Ala Ser Ser Asp Val Arg Ala
    2720   2725   2730

Pro Gln Pro Ser Glu Leu Gly Ala Glu Ser Pro Ser Arg Met Val
    2735   2740   2745

Ala Ser Gln Ala Tyr Asn Leu Thr Ser Ala Leu Met Arg Ile Leu
    2750   2755   2760

Met Arg Ser Arg Val Leu Asn Glu Glu Pro Leu Thr Leu Ala Gly
    2765   2770   2775

Glu Glu Ile Val Ala Gln Gly Lys Arg Ser Asp Pro Arg Ser Leu
    2780   2785   2790

Leu Cys Tyr Gly Gly Ala Pro Gly Pro Gly Cys His Phe Ser Ile
    2795   2800   2805

Pro Glu Ala Phe Ser Gly Ala Leu Ala Asn Leu Ser Asp Val Val
    2810   2815   2820

Gln Leu Ile Phe Leu Val Asp Ser Asn Pro Phe Pro Phe Gly Tyr
    2825   2830   2835

Ile Ser Asn Tyr Thr Val Ser Thr Lys Val Ala Ser Met Ala Phe

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         2840                      2845                      2850

Gln Thr  Gln Ala Gly Ala Gln  Ile Pro Ile Glu Arg  Leu Ala Ser
         2855                      2860                      2865

Glu Arg  Ala Ile Thr Val Lys  Val Pro Asn Asn Ser  Asp Trp Ala
         2870                      2875                      2880

Ala Arg  Gly His Arg Ser Ser  Ala Asn Ser Ala Asn  Ser Val Val
         2885                      2890                      2895

Val Gln  Pro Gln Ala Ser Val  Gly Ala Val Val Thr  Leu Asp Ser
         2900                      2905                      2910

Ser Asn  Pro Ala Ala Gly Leu  His Leu Gln Leu Asn  Tyr Thr Leu
         2915                      2920                      2925

Leu Asp  Gly His Tyr Leu Ser  Glu Glu Pro Glu Pro  Tyr Leu Ala
         2930                      2935                      2940

Val Tyr  Leu His Ser Glu Pro  Arg Pro Asn Glu His  Asn Cys Ser
         2945                      2950                      2955

Ala Ser  Arg Arg Ile Arg Pro  Glu Ser Leu Gln Gly  Ala Asp His
        ·2960                      2965                      2970

Arg Pro  Tyr Thr Phe Phe Ile  Ser Pro Gly Ser Arg  Asp Pro Ala
         2975                      2980                      2985

Gly Ser  Tyr His Leu Asn Leu  Ser Ser His Phe Arg  Trp Ser Ala
         2990                      2995                      3000

Leu Gln  Val Ser Val Gly Leu  Tyr Thr Ser Leu Cys  Gln Tyr Phe
         3005                      3010                      3015

Ser Glu  Glu Asp Met Val Trp  Arg Thr Glu Gly Leu  Leu Pro Leu
         3020                      3025                      3030

Glu Glu  Thr Ser Pro Arg Gln  Ala Val Cys Leu Thr  Arg His Leu
         3035                      3040                      3045

Thr Ala  Phe Gly Ala Ser Leu  Phe Val Pro Pro Ser  His Val Arg
         3050                      3055                      3060

Phe Val  Phe Pro Glu Pro Thr  Ala Asp Val Asn Tyr  Ile Val Met
         3065                      3070                      3075

Leu Thr  Cys Ala Val Cys Leu  Val Thr Tyr Met Val  Met Ala Ala
         3080                      ·                3085            3090

Ile Leu  His Lys Leu Asp Gln  Leu Asp Ala Ser Arg  Gly Arg Ala
         3095                      3100                      3105

Ile Pro  Phe Cys Gly Gln Arg  Gly Arg Phe Lys Tyr  Glu Ile Leu
         3110                      3115                      3120

Val Lys  Thr Gly Trp Gly Arg  Gly Ser Gly Thr Thr  Ala His Val
         3125                      3130                      3135

Gly Ile  Met Leu Tyr Gly Val  Asp Ser Arg Ser Gly  His Arg His
         3140                      3145                      3150
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Leu Asp  Gly Asp Arg Ala Phe  His Arg Asn Ser Leu  Asp Ile Phe
    3155                 3160                 3165

Arg Ile  Ala Thr Pro His Ser  Leu Gly Ser Val Trp  Lys Ile Arg
    3170                 3175                 3180

Val Trp  His Asp Asn Lys Gly  Leu Ser Pro Ala Trp  Phe Leu Gln
    3185                 3190                 3195

His Val  Ile Val Arg Asp Leu  Gln Thr Ala Arg Ser  Ala Phe Phe
    3200                 3205                 3210

Leu Val  Asn Asp Trp Leu Ser  Val Glu Thr Glu Ala  Asn Gly Gly
    3215                 3220                 3225

Leu Val  Glu Lys Glu Val Leu  Ala Ala Ser Asp Ala  Ala Leu Leu
    3230                 3235                 3240

Arg Phe  Arg Arg Leu Leu Val  Ala Glu Leu Gln Arg  Gly Phe Phe
    3245                 3250                 3255

Asp Lys  His Ile Trp Leu Ser  Ile Trp Asp Arg Pro  Pro Arg Ser
    3260                 3265                 3270

Arg Phe  Thr Arg Ile Gln Arg  Ala Thr Cys Cys Val  Leu Leu Ile
    3275                 3280                 3285

Cys Leu  Phe Leu Gly Ala Asn  Ala Val Trp Tyr Gly  Ala Val Gly
    3290                 3295                 3300

Asp Ser  Ala Tyr Ser Thr Gly  His Val Ser Arg Leu  Ser Pro Leu
    3305                 3310                 3315

Ser Val  Asp Thr Val Ala Val  Gly Leu Val Ser Ser  Val Val Val
    3320                 3325                 3330

Tyr Pro  Val Tyr Leu Ala Ile  Leu Phe Leu Phe Arg  Met Ser Arg
    3335                 3340                 3345

Ser Lys  Val Ala Gly Ser Pro  Ser Pro Thr Pro Ala  Gly Gln Gln
    3350                 3355                 3360

Val Leu  Asp Ile Asp Ser Cys  Leu Asp Ser Ser Val  Leu Asp Ser
    3365                 3370                 3375

Ser Phe  Leu Thr Phe Ser Gly  Leu His Ala Glu Gln  Ala Phe Val
    3380                 3385                 3390

Gly Gln  Met Lys Ser Asp Leu  Phe Leu Asp Asp Ser  Lys Ser Leu
    3395                 3400                 3405

Val Cys  Trp Pro Ser Gly Glu  Gly Thr Leu Ser Trp  Pro Asp Leu
    3410                 3415                 3420

Leu Ser  Asp Pro Ser Ile Val  Gly Ser Asn Leu Arg  Gln Leu Ala
    3425                 3430                 3435

Arg Gly  Gln Ala Gly His Gly  Leu Gly Pro Glu Glu  Asp Gly Phe
    3440                 3445                 3450
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Ser Leu Ala Ser Pro Tyr Ser Pro Ala Lys Ser Phe Ser Ala Ser
    3455   3460   3465

Asp Glu Asp Leu Ile Gln Gln Val Leu Ala Glu Gly Val Ser Ser
    3470   3475   3480

Pro Ala Pro Thr Gln Asp Thr His Met Glu Thr Asp Leu Leu Ser
    3485   3490   3495

Ser Leu Ser Ser Thr Pro Gly Glu Lys Thr Glu Thr Leu Ala Leu
    3500   3505   3510

Gln Arg Leu Gly Glu Leu Gly Pro Pro Ser Pro Gly Leu Asn Trp
    3515   3520   3525

Glu Gln Pro Gln Ala Ala Arg Leu Ser Arg Thr Gly Leu Val Glu
    3530   3535   3540

Gly Leu Arg Lys Arg Leu Leu Pro Ala Trp Cys Ala Ser Leu Ala
    3545   3550   3555

His Gly Leu Ser Leu Leu Leu Val Ala Val Ala Val Ala Val Ser
    3560   3565   3570

Gly Trp Val Gly Ala Ser Phe Pro Pro Gly Val Ser Val Ala Trp
    3575   3580   3585

Leu Leu Ser Ser Ser Ala Ser Phe Leu Ala Ser Phe Leu Gly Trp
    3590   3595   3600

Glu Pro Leu Lys Val Leu Leu Glu Ala Leu Tyr Phe Ser Leu Val
    3605   3610   3615

Ala Lys Arg Leu His Pro Asp Glu Asp Asp Thr Leu Val Glu Ser
    3620   3625   3630

Pro Ala Val Thr Pro Val Ser Ala Arg Val Pro Arg Val Arg Pro
    3635   3640   3645

Pro His Gly Phe Ala Leu Phe Leu Ala Lys Glu Glu Ala Arg Lys
    3650   3655   3660

Val Lys Arg Leu His Gly Met Leu Arg Ser Leu Leu Val Tyr Met
    3665   3670   3675

Leu Phe Leu Leu Val Thr Leu Leu Ala Ser Tyr Gly Asp Ala Ser
    3680   3685   3690

Cys His Gly His Ala Tyr Arg Leu Gln Ser Ala Ile Lys Gln Glu
    3695   3700   3705

Leu His Ser Arg Ala Phe Leu Ala Ile Thr Arg Ser Glu Glu Leu
    3710   3715   3720

Trp Pro Trp Met Ala His Val Leu Leu Pro Tyr Val His Gly Asn
    3725   3730   3735

Gln Ser Ser Pro Glu Leu Gly Pro Pro Arg Leu Arg Gln Val Arg
    3740   3745   3750

Leu Gln Glu Ala Leu Tyr Pro Asp Pro Pro Gly Pro Arg Val His

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      3755                    3760                    3765
Thr Cys Ser Ala Ala Gly Gly Phe Ser Thr Ser Asp Tyr Asp Val
      3770                    3775                    3780
Gly Trp Glu Ser Pro His Asn Gly Ser Gly Thr Trp Ala Tyr Ser
      3785                    3790                    3795
Ala Pro Asp Leu Leu Gly Ala Trp Ser Trp Gly Ser Cys Ala Val
      3800                    3805                    3810
Tyr Asp Ser Gly Gly Tyr Val Gln Glu Leu Gly Leu Ser Leu Glu
      3815                    3820                    3825
Glu Ser Arg Asp Arg Leu Arg Phe Leu Gln Leu His Asn Trp Leu
      3830                    3835                    3840
Asp Asn Arg Ser Arg Ala Val Phe Leu Glu Leu Thr Arg Tyr Ser
      3845                    3850                    3855
Pro Ala Val Gly Leu His Ala Ala Val Thr Leu Arg Leu Glu Phe
      3860                    3865                    3870
Pro Ala Ala Gly Arg Ala Leu Ala Ala Leu Ser Val Arg Pro Phe
      3875                    3880                    3885
Ala Leu Arg Arg Leu Ser Ala Gly Leu Ser Leu Pro Leu Leu Thr
      3890                    3895                    3900
Ser Val Cys Leu Leu Leu Phe Ala Val His Phe Ala Val Ala Glu
      3905                    3910                    3915
Ala Arg Thr Trp His Arg Glu Gly Arg Trp Arg Val Leu Arg Leu
      3920                    3925                    3930
Gly Ala Trp Ala Arg Trp Leu Leu Val Ala Leu Thr Ala Ala Thr
      3935                    3940                    3945
Ala Leu Val Arg Leu Ala Gln Leu Gly Ala Ala Asp Arg Gln Trp
      3950                    3955                    3960
Thr Arg Phe Val Arg Gly Arg Pro Arg Arg Phe Thr Ser Phe Asp
      3965                    3970                    3975
Gln Val Ala His Val Ser Ser Ala Ala Arg Gly Leu Ala Ala Ser
      3980                    3985                    3990
Leu Leu Phe Leu Leu Leu Val Lys Ala Ala Gln His Val Arg Phe
      3995                    4000                    4005
Val Arg Gln Trp Ser Val Phe Gly Lys Thr Leu Cys Arg Ala Leu
      4010                    4015                    4020
Pro Glu Leu Leu Gly Val Thr Leu Gly Leu Val Val Leu Gly Val
      4025                    4030                    4035
Ala Tyr Ala Gln Leu Ala Ile Leu Leu Val Ser Ser Cys Val Asp
      4040                    4045                    4050
Ser Leu Trp Ser Val Ala Gln Ala Leu Leu Val Leu Cys Pro Gly
      4055                    4060                    4065
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Thr Gly Leu Ser Thr Leu Cys Pro Ala Glu Ser Trp His Leu Ser
    4070   4075   4080

Pro Leu Leu Cys Val Gly Leu Trp Ala Leu Arg Leu Trp Gly Ala
    4085   4090   4095

Leu Arg Leu Gly Ala Val Ile Leu Arg Trp Arg Tyr His Ala Leu
    4100   4105   4110

Arg Gly Glu Leu Tyr Arg Pro Ala Trp Glu Pro Gln Asp Tyr Glu
    4115   4120   4125

Met Val Glu Leu Phe Leu Arg Arg Leu Arg Leu Trp Met Gly Leu
    4130   4135   4140

Ser Lys Val Lys Glu Phe Arg His Lys Val Arg Phe Glu Gly Met
    4145   4150   4155

Glu Pro Leu Pro Ser Arg Ser Ser Arg Gly Ser Lys Val Ser Pro
    4160   4165   4170

Asp Val Pro Pro Pro Ser Ala Gly Ser Asp Ala Ser His Pro Ser
    4175   4180   4185

Thr Ser Ser Ser Gln Leu Asp Gly Leu Ser Val Ser Leu Gly Arg
    4190   4195   4200

Leu Gly Thr Arg Cys Glu Pro Glu Pro Ser Arg Leu Gln Ala Val
    4205   4210   4215

Phe Glu Ala Leu Leu Thr Gln Phe Asp Arg Leu Asn Gln Ala Thr
    4220   4225   4230

Glu Asp Val Tyr Gln Leu Glu Gln Gln Leu His Ser Leu Gln Gly
    4235   4240   4245

Arg Arg Ser Ser Arg Ala Pro Ala Gly Ser Ser Arg Gly Pro Ser
    4250   4255   4260

Pro Gly Leu Arg Pro Ala Leu Pro Ser Arg Leu Ala Arg Ala Ser
    4265   4270   4275

Arg Gly Val Asp Leu Ala Thr Gly Pro Ser Arg Thr Pro Leu Arg
    4280   4285   4290

Ala Lys Asn Lys Val His Pro Ser Ser Thr
    4295   4300

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<220>
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<220>
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<400>  5                                                          31
atttttttgag atggagcttc actcttgcag g


<210>  6
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<400>  7                                                          21
ccgcccccag gagcctagac g


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<210>  9
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<220>
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<400>  9                                                          20
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<210>  10
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<220>
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<400>  10                                                         20
gtcaacgtgg gcctccaagt


<210>  11
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<220>
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<400>  11                                                         21
agcgcaacta cttggaggcc c


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<400>  12                                                         28
gcagggtgag caggtggggc catcctac


<210>  13
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<210>  14
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<400> 14
agggaggcag aggaaagggc cgaac   25

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ggccctccct gccttctagg cg   22

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cggcgggcgg catcgt   16

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acggcggggc catgcg   16

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gcgtcctggc ccgcgtcc   18

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gggattcggc aaagctgatg                                                    20


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<400>  26
agggcagaag ggatattggg                                                    20


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<220>
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agacccttcc caccagacct                                                    20


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<220>
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<400>  28
tgagccctgc ccagtgtct                                                     19


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cactgaccgt tgacaccctc g   21

<210> 36
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tgccccagtg cttcagagat c   21

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ggagtgccct gagccccct   19

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cccctaacca cagccagcg   19

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tctgttcgtc ctggtgtcct g   21

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gcaggagggc aggttgtaga a   21

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<400> 41
ggtagggdga gtctgggctt   20

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gttgggcatc tctgacggtg   20

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ggaaggtggc ctgaggagat   20

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ggggtccacg ggccatg   17

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aagcccagca gcacggtgag   20

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gcttgcagcc acggaac   17

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gcagtgctac cactgagaac   20

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aggtcaacgt gggcctccaa gtagt   25

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ctggtgacct acatggtcat ggccgagatc

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ggttgtctat cccgtctacc tggccctcct

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Trp Asp Phe Gly Asp Gly Ser
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His Leu Thr Ala
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tggagggagg gacgccaatc

<210> 63
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<210>  69
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<210>  70
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<210>  71
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<400>  71                                                                    18
caggctgcgt ggggatgc


<210>  72
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<400>  72                                                                    18
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<210>  73
<211>  18
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<400>  73                                                                    18
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<210>  74
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<210>  75
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<220>
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<223> PCR primer 15R12

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<210> 76
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<212> DNA
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<220>
<223> PCR primer 15F11

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<210> 77
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<212> DNA
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<220>
<223> PCR primer 15R11

<400> 77
tgaagtcacc tgtgctgttg t   21

<210> 78
<211> 19
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<220>
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<400> 78
ctacctgtgg gatctgggg   19

<210> 79
<211> 18
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<220>
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<400> 79
tgctgaagct cacgctcc   18

<210> 80
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<220>
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<400> 80
gggctcgtcg tcaatgcaag   20

<210> 81
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<220>
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<400> 81
caccacctgc agcccctcta   20

<210> 82
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<220>
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<400> 82
ccgcccagga cagcatcttc   20

<210> 83
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<400> 83
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<210> 84
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<210> 86
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gcccagcacc agctcacat   19

<210> 88
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<220>
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<400> 88
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<210> 89
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<212> DNA
<213> Artificial sequence

<220>
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<400> 89
ggcagccagc aggatctgaa   20

<210> 90
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<212> DNA
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